L. L. NARAYANA* & D. RAO*: Contributions to the floral anatomy of Linaceae (1)

ナラヤナ*・ラオ*: アマ科植物の花部解剖学的研究 (1)

Introduction

Although, the Linaceae have received attention from the point of view of floral anatomy (Saunders, 1937; Narayana, 1964; Narayana & Rao, 1966) a number of species remain uninvestigated. In this paper, which is the first in the series, the floral anatomy of *Anisadenia saxatilis* Wall. is described. The genus *Anisadenia* is herbaceous and is represented by two species, *A. saxatilis* Wall. and *A. pubescens* Griff., which are distributed in the central and eastern temperate Himalayas (Hooker, 1875).

Material and method

The fresh material of flowers in various stages of development was collected at Elephant Falls, Shillong. FAA was used for fixation. Usual methods of dehydration, infiltration and embedding were followed. Sections cut between 9–12 microns of thickness were stained using crystal violet and erythrosin combination.

Flower

The flower is pedicellate, bracteate, bracteolate, pentacyclic, pentamerous, heterochlamydeous, regular, bisexual and hypogynous (Figs. 1, 2, 23, 29). The sepals show quincuncial aestivation and exhibit basal connation (Figs. 19, 20, 23). Each sepal shows a groove along the midline on the abaxial side (Figs. 16, 20, 23). The two sepals which are completely outside bear stalked glands along both the margins (Figs. 3, 4); the sepal which has one of the margins outside bears only one row of glands (Fig. 5); and the remaining two sepals which are completely inside do not bear any gland (Figs. 6, 7). The gland shows a stalk and a globose head (Figs. 1–5) whose epidermal cells are

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radially elongated with prominent nuclei and dense cytoplasm (Fig. 8). A vascular bundle enters the base of the stalk (Figs. 1–5). The free petals show contorted aestivation (Fig. 29). The androecium is monadelphous at the base, consisting of five fertile antisepalous stamens alternating with as many non-vascularised staminodes (Figs 21–28). One of the fertile stamens has a prominently developed gland at the base (Figs. 19–23). The ovary is 3-carpellary, syncarpous, 3-locular with two pendulous, anatropous, bitegmic ovules in each loculus (Figs. 25–27) ; it becomes unilocular towards the top (Fig. 28). The free styles are grooved on their adaxial sides (Fig. 29). The stigmas are capitate and are covered by glandular hairs (Figs. 1, 2).

Floral anatomy

The bract and bracteoles receive a trace each (Figs. 1, 9–11). The vascular bundle in the bract divides to form five to six smaller bundles (Figs. 9–11). Above the level of origin of the bracteole traces the pedicel shows a ring of five bundles (Fig. 12). It expands in the receptacle and forms a closed ring (Fig. 15). The sepal midrib traces and the common sepal lateral traces arise from this ring in one whorl (Fig. 16). The sepal traces bend down and then enter the sepals (Figs. 1, 2). These traces divide to form smaller bundles in the sepals (Figs. 14–20, 23). Prominent sclerenchymatous bands overlie the vascular bundles of the sepals (Figs. 3–7, 15–20, 23). After the departure of the sepal traces, five petal traces originate along the radii of sepal lateral traces (Fig. 17). They diverge out and enter the petals where they divide into smaller bundles (Figs. 19–29).

The main stele assumes a pentagonal outline (Figs. 18, 19). At this level the staminal traces originate (Figs. 19, 20). The trace that supplies the stamen, which has a gland at the base leaves the main stele earlier than the traces for the remaining four stamens (Figs. 19, 20). After the organization of the staminal supply, the main stele appears in the form of three closely placed vascular bundles (Fig. 21). These unite at a higher level to form a closed ring with triangular outline (Fig. 22). The dorsal carpellary traces arise from these three angles and as they emerge out, each produces two lateral branches which swing sidewards (Fig. 23). The lateral bundles derived from the adjacent dorsal carpellary traces lie at the base of the septa and extend upto the top of the ovary (Figs. 24–27). From the remaining stele, three inversely oriented common ventral bundles are organized and these lie along the septal radii (Fig. 25). In the placental region each ventral bundle splits into two and they supply the ovules in adjacent loculi (Figs. 26, 27). At a higher level the ovary becomes unilocular (Fig. 28). The dorsal carpellary bundles continue into the styles and terminate near the base of the glandular stigmas (Figs. 1, 2, 29).

Summary and conclusion

The flower is pentacyclic and pentamerous. The five quincuncial sepals are three traced. Connation between lateral traces of adjacent sepals is noticed. Rows of three to four stalked glands are noticed along the outer margins of the sepals. The free contorted petals are single traced.

The fertile stamens are single traced and the antipetalous staminodes are devoid of any vascular supply. Only one of the five fertile stamens bears a gland at its base.

Ovary is 3-carpellary, syncarpous with two collateral ovules in each loculus. The carpels are three traced and the placentation is anatomically parietal. The dorsal carpellary bundles constitute the stylar supply.

Acknowledgments

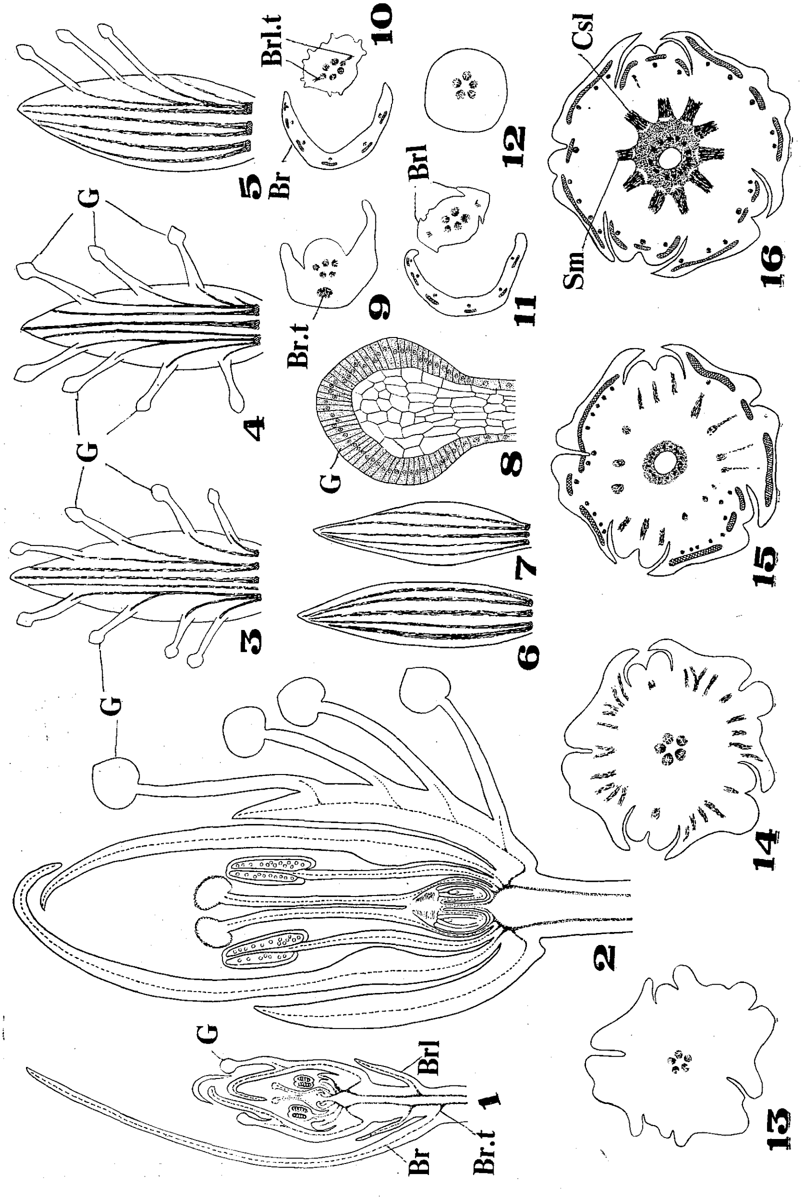
Our thanks are due to Professor M.R. Suxena, for his keen interest and encouragement and to Dr. K. Subramanyam for criticism and helpful suggestions. We are indebted to Dr. A.S. Rao, Shillong for kindly sending the fixed material.

Explanation of figures

Abbreviations: Br., bract; Brl., bracteole; Br. t., bract trace; Brl. t., bracteole trace; C. Sl., common sepal lateral traces; Cv., common ventrals; Db., dorsal bundle; Dct., dorsal carpellary trace; G., gland; Pt., petal trace; Sm., sepal midrib trace; St., staminal trace; St. b., staminal bundle; St. t., staminal tube.

Figs. 1. *Anisadenia saxatilis.*

1, 2 : Semidiagrammatic and diagrammatic longitudinal sections of flowers showing the course of vascular supply to the different floral parts.
3-5 : Sepals in abaxial view showing stalked glands.
6, 7 : Sepals without glands.
8 : Gland enlarged.
9-29: Serial transverse sections of flower showing the origin and distribution of traces to the different floral parts. For each case see text.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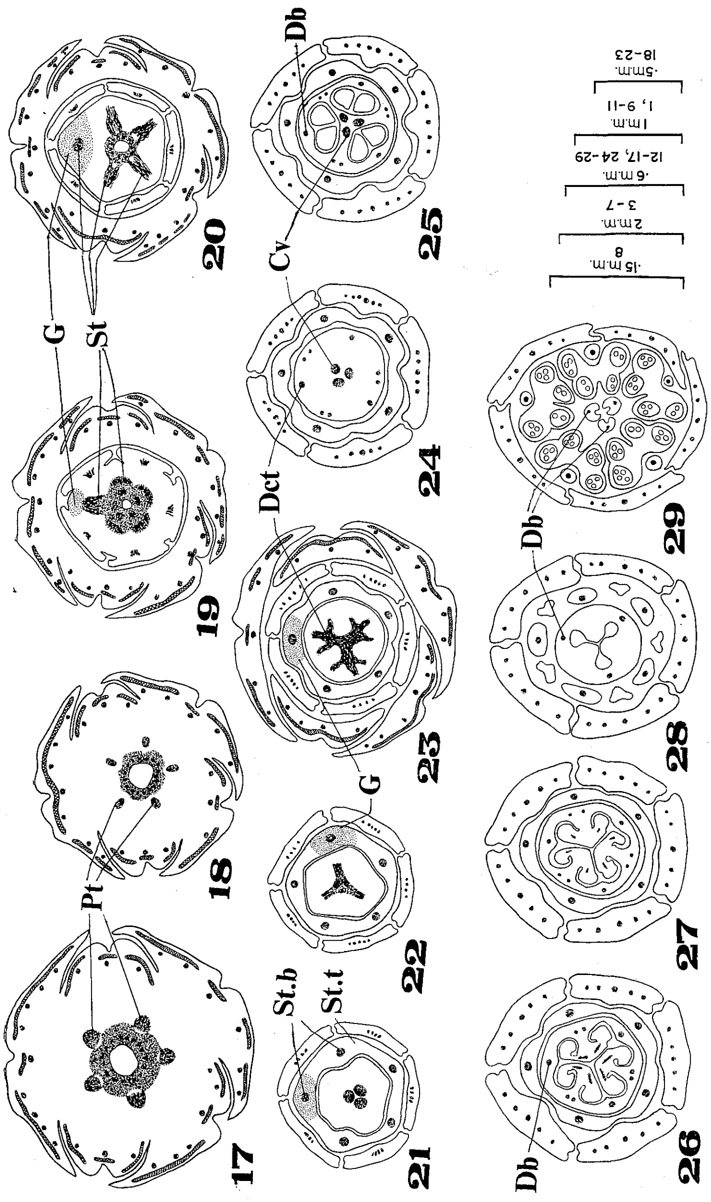
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2m.m. 3-7
·6m.m. 12-17, 24-29
1m.m. 1, 9-11
·5m.m. 18-23

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東部ヒマラヤに分布するアマ科植物，*Anisadenia saxatilis* Wall. の花部解剖学的知見を述べる。花は5数性；がく片は5脈であるが側脈は基部で2本ずつ癒合する；花弁は1葉跡である；雄ずい10本の中で外輪の5本が完全，中の1本は基部に腺体が発達，内輪の5本は仮雄ずい化して維管束がない；子房は3心皮性3室，上方で1室になるが，各隔壁の左右両側に1個ずつの（各室に2）胚珠を生ずる；各心皮は3葉跡を受け，解剖学的には側膜胎座である；背縫維管束が花柱に入り，柱頭直下に止まる。

□精選牧野植物図集　469頁，図版355（内カラー32），1969年5月，学習研究社，3,500円，牧野先生が精魂こめて描かれた植物の図を集大成したものである。先生の植物画は，先生から直接伺ったところでは，キュー植物園で出版していたカーチスの植物図譜（Curtis' Botanical Magazine）の画を自ら描くだけでなく自ら銅版に彫り，さらにそれに自ら彩色をしたFitchの描画の正確さに先生がほれこまれて，もっぱらその画を手本として精進されたのであるが，この画は正にその事をよく示しているほど正確さと画法の類似において他に比をみない。描画当時は問題にされていなかったのに後年大いに注目を惹くようになった特徴がちゃんと先生の図には描かれていることを発見することがあるくらい正確なのである。

この図集には更に今までになかったよい点がいくつかある。一つは未出版の図が多く拾ってあること，二つは全図版が出版の序列ではなくて分類順で配列されていること，三つは思いの外に廉価であること。今までに出版された図集を古書でもとめようとすれば甚だ高価であり，しかも絶版で入手の見込がないことを考えればこれは大変な安い値段である。

先生を知る人はこの書を披いて先生を偲ぶにふさわしく，先生を知ると共に先生によって象徴化された植物の良さもまた知ることができよう。（前川文夫）